

WHAT IS CLAIMED IS:

1 1. A method for magnetic resonance elastography of at least a section of
2 the brain comprising the steps of:

3 examining the head of a patient in vivo in a magnetic resonance device;

4 vibrating the head of the patient during the examination at a selected
5 frequency between 125 hertz and 500 hertz;

6 observing and plotting phase alteration of voxel isochromats at the selected
7 frequency to obtain phase patterns; and,

8 measuring the phase patterns across at least the section of the brain.

1 2. The method for magnetic resonance elastography of at least a section
2 of the brain according to claim 1 wherein the measuring by observing phase patterns
3 includes:

4 repeating the examining, vibrating, observing and plotting, and measuring
5 steps for a group of individuals; and,

6 comparing the measuring of the phase patterns from one individual to other
7 individuals.

1 3. The method for magnetic resonance elastography of at least a section
2 of the brain according to claim 1 wherein the measuring by observing phase patterns
3 includes:

4 analyzing the phase patterns utilizing Hilbert transforms.

1 4. The method for magnetic resonance elastography of at least a section
2 .of the brain according to claim 1 wherein the measuring by observing phase patterns
3 includes:

4 analyzing the phase patterns by utilizing the shear modulus.

1 5. The method for magnetic resonance elastography of at least a section
2 .of the brain according to claim 1 wherein the measuring by observing phase patterns
3 includes:

4 analyzing the phase patterns by utilizing the local wavelength.

1 6. The method for magnetic resonance elastography of at least a section
2 of the brain according to claim 1 wherein:

3 the observing and plotting phase alteration of voxel isochromats occurs after
4 vibrating the head of the patient for about a time period of 5 - 200 msec.

1 7. A method for magnetic resonance elastography of at least a section of
2 the brain comprising the steps of:

3 affixing a coil to the head of the patient in a magnetic resonance device having
4 a magnetic field;

5 passing alternating current through the coil to cause vibrational energy to pass
6 from the coil to the head of the patient at a selected frequency between 125 hertz and 500
7 hertz;

8 after the passing step, examining the head of a patient in the magnetic
9 resonance device;

10 observing and plotting phase alteration of voxel isochromats at the selected
11 frequency to obtain phase patterns; and,

12 measuring the elasticity of the brain by observing the phase patterns across at
13 least the section of the brain.

1 8. The method for magnetic resonance elastography according to claim 7
2 and wherein:

3 observing and plotting phase alteration of voxel isochromats at the selected
4 frequency to obtain phase patterns immediately after passing of the alternating current
5 through the coil has ceased but before vibrational energy within the head of the patient
6 dissipates.

1 9. The method for magnetic resonance elastography according to claim 7
2 and wherein the affixing of a coil to the head of the patient includes:

3 placing a shaft through the coil to receive vibrations from the coil;

4 placing a probe in rigid contact with a shaft at one portion and preloading the
5 probe into contact with a human skull at another portion; and,

6 vibrating the coil to impart vibrations through the shaft to the probe to vibrate
7 in vivo a human brain within the skull.

1 10. The method for magnetic resonance elastography according to claim 9
2 and wherein the preloading of the probe into contact with the human skull includes:
3 preloading the probe into contact with the acoustic window of the human
4 skull.

1 11. A method for magnetic resonance elastography of at least a section of
2 the brain comprising the steps of:
3 examining the head of a patient in vivo in a magnetic resonance device;
4 observing the periodicity of the patient's heartbeat for determining a sampling
5 interval with respect to the patient's heartbeat;
6 vibrating the head of the patient immediately before a sampling interval at a
7 selected frequency between 125 hertz and 500 hertz;
8 observing and plotting phase alternation of voxel isochromats at the selected
9 frequency to obtain phase patterns; and,
10 measuring by observing the phase alternation across at least the section of the
11 brain.

1 12. The method for magnetic resonance elastography of at least a section
2 of the brain according to claim 11 comprising the further steps of:
3 ceasing the vibrating immediately before the observing and plotting step.

1 13. An apparatus for improved magnetic resonance analysis of the brain
2 during magnetic resonance examination comprising:
3 a mounting for preloading a probe on to the cranium of the patient in a
4 magnetic resonance device;
5 a coil affixed to the probe for passing vibrations from the coil to the probe;
6 and,
7 means for passing an alternating current through the coil in the range of 125
8 hertz to 500 hertz to cause the coil to vibrate within the magnetic field of the magnetic
9 resonance device and pass the vibrations of the coil to the probe.

1 14. The apparatus for improved magnetic resonance analysis of the brain
2 during magnetic resonance examination according to claim 13 and wherein means for passing
3 alternating current through the coil includes:
4 a high pass filter and a current stabilized amplifier.